SecondOpinion: Interactive Web-based Access to a Decision Model

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The use of decision modeling to evaluate risks and benefits of medical treatments or screening programs for groups of patients or the nation as a whole is an often used and efficient method that is gaining wide acceptance. Pauker and others first conceived using decision models in the late 1970s and early 1980s at the bedside to aid in individual clinical decisions.[1,2] Computers have long been thought to be instrumental in this task.[3]

By incorporating patient preference elicitation via automated computer interviewing techniques into decision model systems, it should be possible to conduct a "conversation" with the patient. We have developed such an automated system, similar to the model proposed by Cher and Lenert[4], which is able to respond in an appropriate fashion to each patient's responses so as to reach a recommendation (if possible) with certainty in the most efficient manner for each patient. This bridges the underlying decision model and the patient's individuality, thus leading to a "humanized," custom solution for each patient.

The SecondOpinion architecture provides that experience via a customized interaction with the decision model based on the patient's preferences. The discussion is modeled with a hierarchical set of five states: error, certainty, feedback, review, and assessment. A rapid Markov model, based on the methods of Cher and Lenert[4] is used. An example model is shown in Figure 1. The decision model calculates the quality-adjusted life expectancy afforded by four different initial treatment strategies for BPH: watchful waiting, medical treatment with terazosin, transurethral resection (TUR) and transurethral microwave thermotherapy (TUMT) - a new minimally invasive surgical treatment.

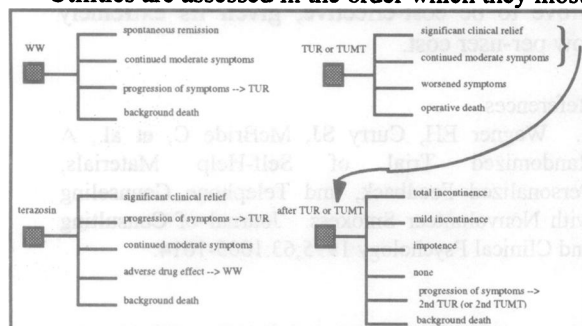Utilities are assessed in the order which they most

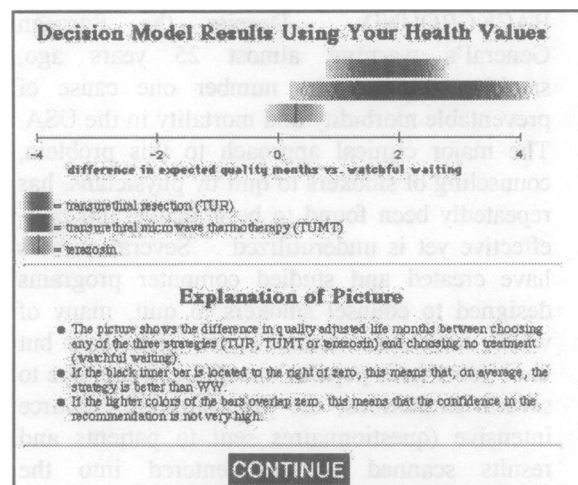**Figure 1.** Rapid Markov Decision Model for BPH

Figure 2. Example of A Feedback Screen

contribute to the variance of the 95% confidence interval of the model prediction. Feedback is provided to the user with a gradient bar graph depicting the 95% CI about the recommendation certainty. A sample feedback screen is shown in Figure 2.

The URL for a prototype website for providing decision analysis advice on treatment options for benign prostatic hyperplasia (BPH) is preferences.stanford.edu/SecondOpinion/index.html

REFERENCES

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3 Pauker SG, Kassirer JP. Clinical decision analysis by personal computer. Arch Intern Med 1981;141(13)1831-7.

4 Cher DJ, Lenert LA. Rapid estimation of confidence intervals for Markov process decision models: applications in decision support systems. JAMIA (In press).